

## Claims

What is claimed is:

1. A process for forming a conductive bump attached to a dielectric film, said process comprising:

5 providing a dielectric film having a first side, a second side and at least one via filled by a metal plug having a planar surface exposed at said first side of said dielectric film;

controllably etching said dielectric film from around said planar surface of said metal plug to provide a dielectric film having a metallic projection protruding therefrom.

10 2. The process of claim 1 wherein an array of vias are filled with metal plugs and the controlled etching provides an array of co-planar metallic projections.

3. The process of claim 1 wherein an array of vias are filled with metal plugs and the controlled etching provides an array of metallic projections surrounded by a dielectric mask.

15 4. The process of claim 1 further comprising depositing metal on said metallic projection to produce said conductive bump extending out from said metallic projection to cover a portion of said etched surface.

20 5. The process of claim 1, wherein said dielectric film comprises a polymer selected from the group consisting of polycarbonate polymers, liquid crystal polymers and polyimide copolymers including carboxylic ester structural units in the polymeric backbone.

25 6. The process of claim 5, wherein said liquid crystal polymers are selected from the group consisting of copolymers containing p-phenyleneterephthalamide and copolymers containing p-hydroxybenzoic acid.

7. The process of claim 5, wherein said polyimide copolymers comprise the reaction product of monomers including p-phenylene bis(trimellitic acid monoester anhydride).

8. The process of claim 1, wherein said controllably etching said dielectric film uses a chemical milling reagent including an alkali metal hydroxide.

5 9. The process of claim 8, wherein said chemical etching reagent further includes an amine.

10. The process of claim 9, wherein said alkali metal hydroxide is potassium hydroxide and said amine is ethanolamine.

10 11. A process for forming a conductive bump protruding from a dielectric film, said process comprising:

providing a dielectric film having a first side and a second side;

applying a stop layer to at least said first side of said dielectric film, said stop layer

15 having an underside in contact with said first side of said dielectric film;

forming a cavity in the dielectric film that extends through said dielectric film from said second side of said dielectric film to said stop layer;

depositing conductive material to form a conductive plug in said cavity;

20 removing said stop layer from said first side of said dielectric film to expose a surface of said conductive plug;

controllably etching said dielectric film from around said conductive plug surface to form said conductive bump protruding from said dielectric film.

25 12. The process of claim 11 further comprising depositing metal on said conductive bump such that it extends out in x and y directions to cover a portion of said etched dielectric surface.

13. The process of claim 11 wherein an array of cavities are filled with metal plugs and the controlled etching provides an array of co-planar metallic projections.

14. The process of claim 11 wherein an array of cavities are filled with metal plugs and the controlled etching provides an array of metallic projections surrounded by a dielectric mask.

5 15. The process of claim 11, wherein said stop layer is a metal layer.

16. The process of claim 11, wherein said stop layer is a flash-plated metal layer.

10 17. The process of claim 11, wherein said dielectric film comprises a polymer selected from the group consisting of liquid crystal polymers, polycarbonates, and polyimide copolymers including carboxylic ester structural units in the polymeric backbone.

18. A process for forming a conductive bump protruding from a dielectric film, said process comprising:

15 providing a dielectric film having a first side and a second side;  
forming an opening in the dielectric film that extends through said dielectric film from said first side to said second side of said dielectric film;  
applying a stop layer to said second side of said dielectric film such that said opening is closed off by the stop layer on the side of the opening adjacent the second side, thereby  
20 forming a cavity;  
depositing conductive material to form a conductive plug in said cavity;  
removing said stop layer from said second side of said dielectric film to expose a surface of said conductive plug;  
controllably etching said dielectric film from around said conductive plug surface to  
25 form said conductive bump protruding from said dielectric film.

19. The process of claim 18 further comprising depositing metal on said conductive bump such that it extends out in x and y directions to cover a portion of said etched dielectric surface.

20. The process of claim 18 wherein an array of cavities are filled with metal plugs and the controlled etching provides an array of co-planar metallic projections.

21. The process of claim 18 wherein an array of cavities are filled with metal plugs and the controlled etching provides an array of metallic projections surrounded by a dielectric mask.

22. The process of claim 18, wherein said stop layer is a polymer resin layer.

23. The process of claim 18, wherein said dielectric film comprises a polymer selected from the group consisting of polycarbonate polymers, liquid crystal polymers, and polyimide polymers including carboxylic ester structural units in the polymeric backbone.

24. An article for providing an electrical connection between at least a pair of electronic components, said article comprising:

a dielectric film having a first side, a second side and at least one metal-filled via, said dielectric film further having an etched film portion on at least said first side, said etched film portion including an etched surface adjacent to said metal filled via; and

a conductive bump extending upward from said at least one metal-filled via at said first side of said dielectric film, said conductive bump providing electrical connection to one of said at least a pair of electronic components.

25. The article of claim 24 wherein the conductive bump extends outwardly in x and y directions from said at least one metal-filled via to cover a portion of said etched surface.

26. The article of claim 24 comprising an array of co-planar conductive bumps.

27. The article of claim 26 wherein the array of co-planar conductive bumps are surrounded by the partially etched dielectric film thereby forming a non-conductive mask around the conductive bumps.